SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-42

Name: Oak Lake **County**: Brookings
Legal Description: T110N- R48W-Sec 1, 12, 13; T112N-R47W-Sec 7, 18
Location from nearest town: 6 miles north and 5 miles east of White, SD

Dates of present survey: June 30-July 1, 2009
Dates of last survey: July 2-3, 2007

Primary Game and Forage Species	Other Species
Walleye	Northern Pike
Yellow Perch	Common Carp
	Black Bullhead
	White Sucker
	Bigmouth Buffalo
	Saugeye

PHYSICAL DATA

Surface Area: 396 acres **Watershed area**: 4,480 acres
Maximum depth: 6 feet **Mean depth**: 4 feet
Volume: 1,560 acre feet **Shoreline length**: Unknown
Contour map available: Yes **Date mapped**: 1956
OHWM elevation: 1802.3 **Date set:** 1983
Outlet elevation: 1801.8 **Date set:** 1983
Lake elevation observed during the survey: Full
Beneficial use classifications: (6) Warmwater marginal fish propagation, (7) immersion recreation, (8) limited-contact recreation, (9) fish and wildlife propagation, recreation, and stock watering

Introduction

Oak Lake is located in the northeast corner of Brookings County on the east slope of the Coteau des Prairie. It was named for the abundance of oak trees surrounding the shoreline. The lake receives its water from watershed runoff and a limited aquifer connection. Overflow runs northeast into Fish Lake in Deuel County then east into Minnesota.

Ownership of Lake and Adjacent Lakeshore Property

Oak Lake is listed as a meandered lake in the State of South Dakota Listing of Meandered Lakes and the South Dakota Department of Game, Fish and Parks (GFP) manages the fishery. GFP owns and manages a small lake access area on the northeast corner of the lake. The remainder of the shoreline is privately owned.

Fishing Access

The Oak Lake Access Area has a single lane, concrete plank boat ramp that is in poor condition and there is little room for parking. A project to install a new boat ramp and improve the access area has been approved and should be completed by late 2011. Shore fishing opportunity is limited to the access area. The lake is a popular ice fishing location for walleye and yellow perch.

Field Observations of Water Quality and Aquatic Vegetation

The water in Oak Lake had a Secchi depth measurement of 0.76 m (30 in). Heavy vegetation in the form of sago pondweed (*Potamogeton pectinatus*) and clasping leaf pondweed (*Potamogeton richardsonii*) was observed throughout the entire lake.

BIOLOGICAL DATA

Methods:

Oak Lake was sampled on June 30-July 1, 2009 with three overnight gill-net sets and five overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh (¾ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh (½, ¾, 1, 1¼, 1½, and 2 in) monofilament netting. Sampling locations are displayed in Figure 4.

Winterkill:

Oak Lake suffered a moderate winterkill in 2008-2009 that reduced the yellow perch and walleye populations. The lake was restocked with yellow perch and walleye fingerlings in 2009 (Table 7).

Results and Discussion:

Gill Net Catch

Black bullhead (56.3%) was the most abundant species sampled in the gill nets this year (Table 1). Other species sampled included yellow perch, walleye, northern pike, and white sucker.

Table 1. Total catch from three overnight gill net sets at Oak Lake, Brookings County, June 30-July 1, 2009.

Species	Number	Percent	CPUE[1]	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	116	56.3	38.7	±14.3	44.0	26	1	108
Yellow Perch	47	22.8	15.7	±3.1	14.4	14	3	109
Walleye	30	14.6	10.0	±1.5	5.6	100	3	100
Northern Pike	10	4.9	3.3	±1.1	3.4	60	0	88
White Sucker	3	1.5	1.0	±0.7	1.7	--	--	--

* 5 years (1998, 2000, 2003, 2005, 2007)

Trap Net Catch

Black bullheads (98.7%), northern pike, and walleye were the only species sampled in the trap nets.

Table 2. Total catch from five overnight trap net sets at Oak Lake, Brookings County, June 30-July 1, 2009.

Species	#	%	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	298	98.7	59.6	±29.9	180.4	20	4	96
Northern Pike	3	1.0	0.6	±0.5	3.0	--	--	--
Walleye	1	0.3	0.2	±0.3	0.4	--	--	--

* 5 years (1998, 2000, 2003, 2005, 2007)

[1] See Appendix A for definitions of CPUE, PSD, and mean Wr.

Walleye

Walleye gill-net CPUE dropped to 10.0 this year (Table 3) probably due to the partial winterkill. It appears the 2004 and 2006 stockings (Table 7) produced the only year classes sampled in this survey (Figure 1). No fish below 380 mm (15 in) were sampled and their mean length was 457 mm (18 in).

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for Oak Lake, Brookings County, 2001-2009.

	2001	2002	2003	2004	2005	2006	2007	2008	2009
CPUE					4.0		24.0		10.0
PSD					0		48		100
RSD-P					0		3		3
Mean Wr					99		101		100

Yellow Perch

Yellow perch gill net CPUE increased to 15.7 (Table 4) in spite of the winterkill. About 20% of the perch sampled were age-0. Yellow perch fingerlings (198,380) marked with oxytetracycline (OTC) were stocked in 2009. Later in the summer, a large sample of age-0 perch was collected with minimum seining effort and only 2% were marked indicating a large year class was naturally produced after the winterkill.

Table 4. Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for Oak Lake, Brookings County, 2000-2009.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
CPUE	6.3			36.0		10.3		8.0		15.7
PSD	82			81		55		48		14
RSD-P	6			10		3		1		3
Mean Wr	104			--		102		92		109

Black Bullhead

Black bullhead trap-net CPUE decreased to 59.6, PSD increased slightly to 20 and RSD-P increased to 4 (Table 5) indicating a shift to a lower density, higher quality population. The length-frequency histograms in Figure 3 show several year classes with a wide range of lengths from 8 to 33 cm (3.1-13.0 in) and an average length of 179 mm (7.0 in).

Table 5. Black bullhead trap-net CPUE, PSD, RSD-P, and mean Wr for Oak Lake, Brookings County, 2000-2009.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
CPUE	49.8			94.4		56.0		304.0		59.6
PSD	76			43		28		19		20
RSD-P	0			19		23		0		4
Mean Wr	--			--		100		85		96

All Species

CPUE for all species sampled decreased in 2009 except yellow perch which increased. No common carp were sampled in this year's survey, however they were observed in the lake during the survey. One very large saugeye was seen escaping a trap net as it was being lifted.

Table 6. Gill-net (GN) or trap-net (TN) CPUE for all fish species sampled in Oak Lake, Brookings County, 2000-2009.

Species	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
COC (GN)	1.3			0.7		0.3		--		--
COC (TN)	0.8			6.2		1.6		--		--
WHS (GN)	--			1.3		5.7		1.0		1.0
WHS (TN)	--			0.4		1.2		--		--
BIB (GN)	0.7			50.0		--		--		--
BIB (TN)	--			--		0.6		--		--
BLB (GN)	110.6			20.0		9.0		52.5		38.7
BLB (TN)	49.8			94.4		56.0		304.0		59.6
NOP (GN)	0.3			0.7		8.0		5.5		3.3
NOP (TN)	0.6			1.8		5.2		3.0		0.6
GSF (TN)	--			0.2		--		--		--
OSF (GN)	--			--		--		0.5		--
OSF (TN)	--			--		0.2		0.3		--
YEP (GN)	6.3			36.0		10.3		8.0		15.7
YEP (TN)	0.6			8.6		1.2		6.8		--
SXW (GN)	10.7			43.7		6.7		--		--
SXW (TN)	0.4			6.0		2.0		--		--
WAE (GN)	--			--		4.0		24.0		10.0
WAE (TN)	--			--		1.0		1.0		0.2

COC (Common Carp), WHS (White Sucker), BIB (Bigmouth Buffalo), BLB (Black Bullhead), NOP (Northern Pike), GSF (Green Sunfish), OSF (Orangespotted Sunfish), YEP (Yellow Perch), SXW (Saugeye), WAE (Walleye),

MANAGEMENT RECOMMENDATIONS

1. Continue to monitor the Oak Lake fishery by conducting lake surveys every other year with the next occurring in 2011.

2. Continue to stock walleye fingerlings every other year. Stock marked yellow perch into voids of natural production. Evaluate stocking by conducting lake surveys and checking for marked fish.

Table 7. Stocking record for Oak Lake, Brookings County, 1991-2009.

Year	Number	Species	Size
1992	250,000	Northern Pike	Fry
	40,207	Yellow Perch	Fingerling
1994	3,360	Fathead Minnow	Adult
	17,020	Yellow Perch	Fingerling
	4,082	Yellow Perch	Adult
1995	65,000	Saugeye	Fingerling
1996	42,000	Saugeye	Fingerling
	3,793	Yellow Perch	Fingerling
1998	2,326	Saugeye	Juvenile
1999	48,750	Saugeye	Fingerling
	4,005	Yellow Perch	Adult
2001	39,900	Saugeye	Fingerling
	5,928	Yellow Perch	Juvenile
2004	39,200	Walleye	Fingerling
2006	40,000	Walleye	Fingerling
	4,170	Yellow Perch	Juvenile
2009	20,000	Walleye	Fingerling
	7,153	Yellow Perch	Juvenile
	198,380	Yellow Perch	Fingerling

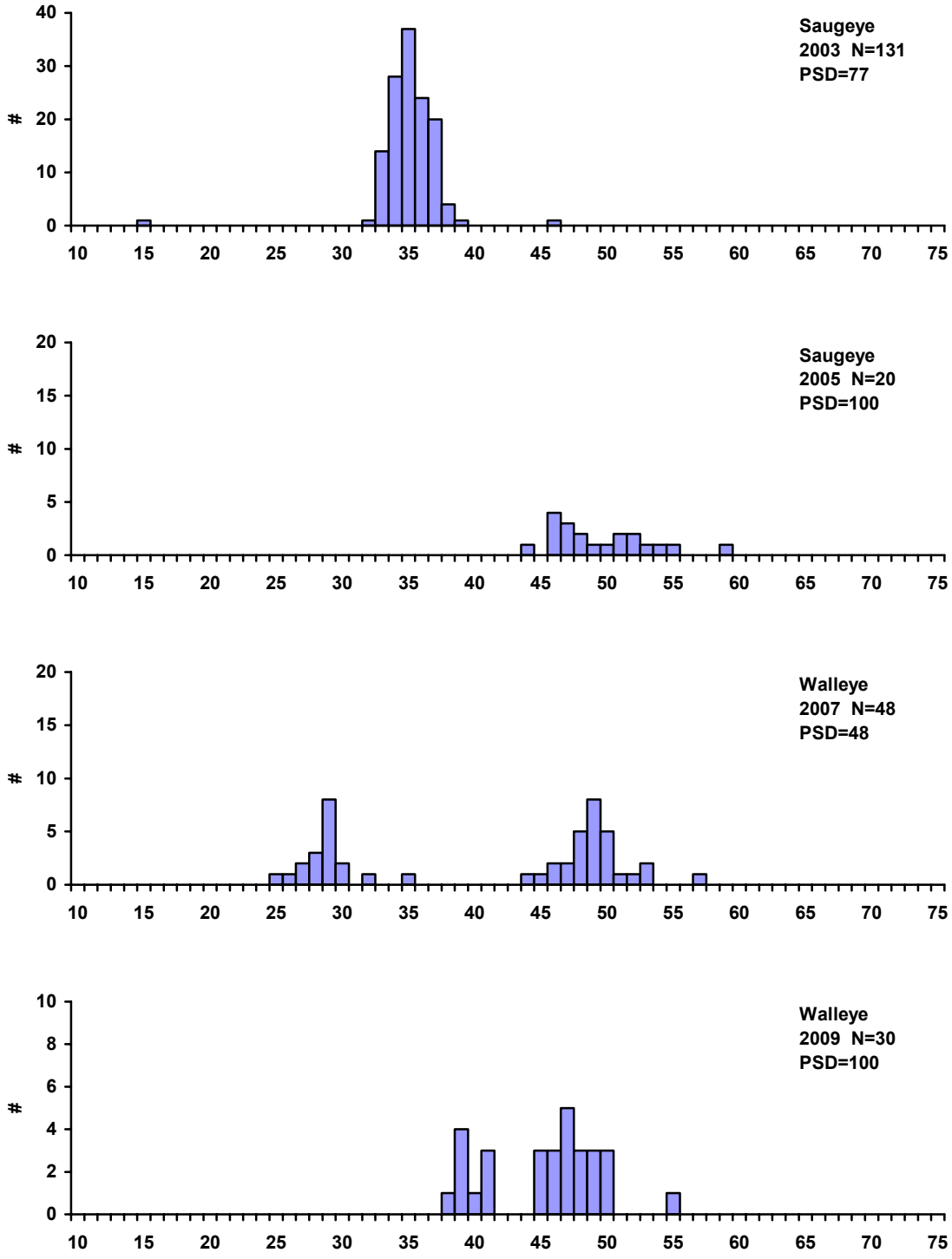

Figure 1. Length frequency histograms for walleye and saugeye sampled with gill nets in Oak Lake, Brookings County, 2003, 2005, 2007 and 2009.

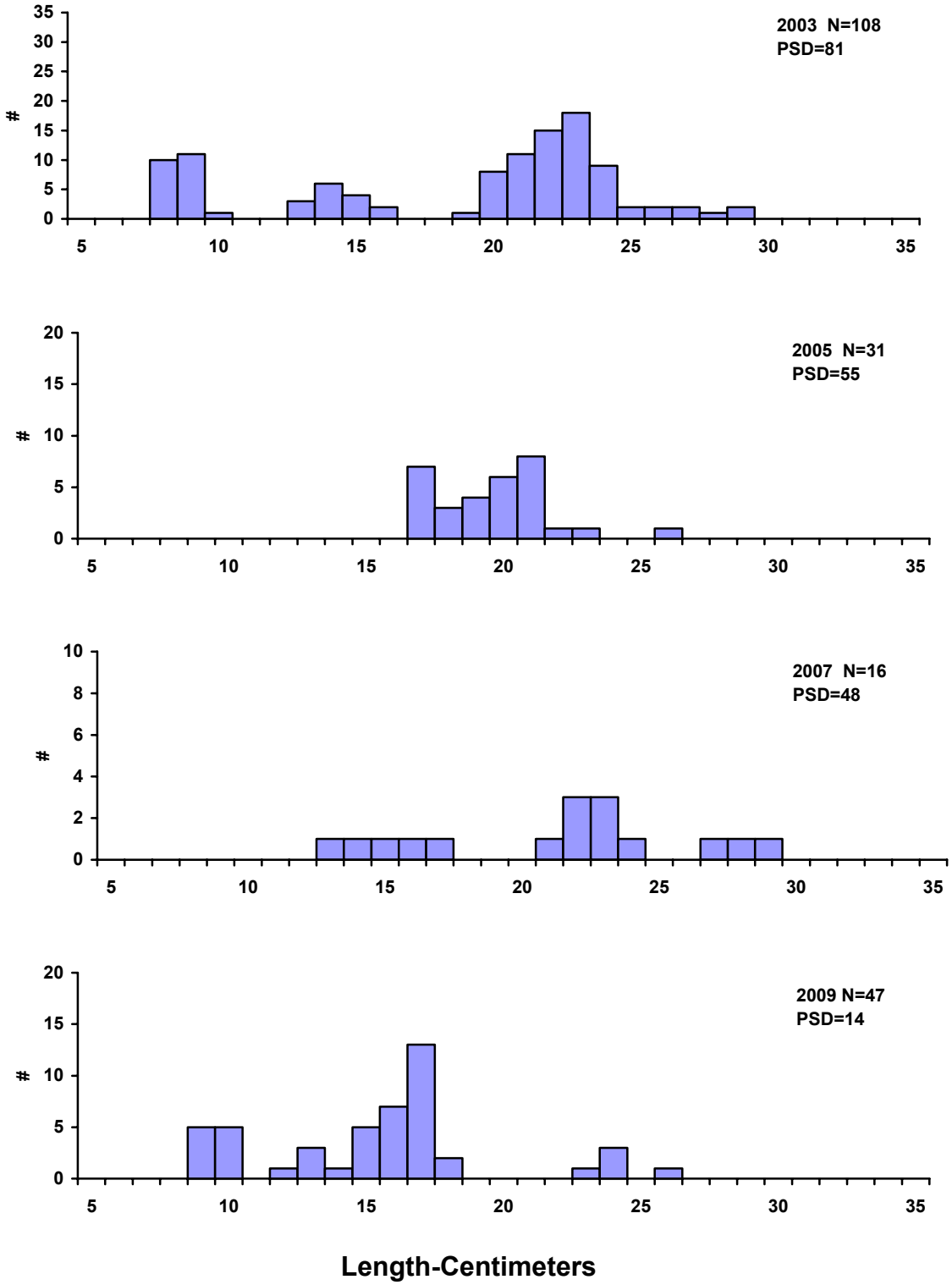

Figure 2. Length frequency histograms for yellow perch sampled with gill nets in Oak Lake, Brookings County, 2003, 2005, 2007 and 2009.

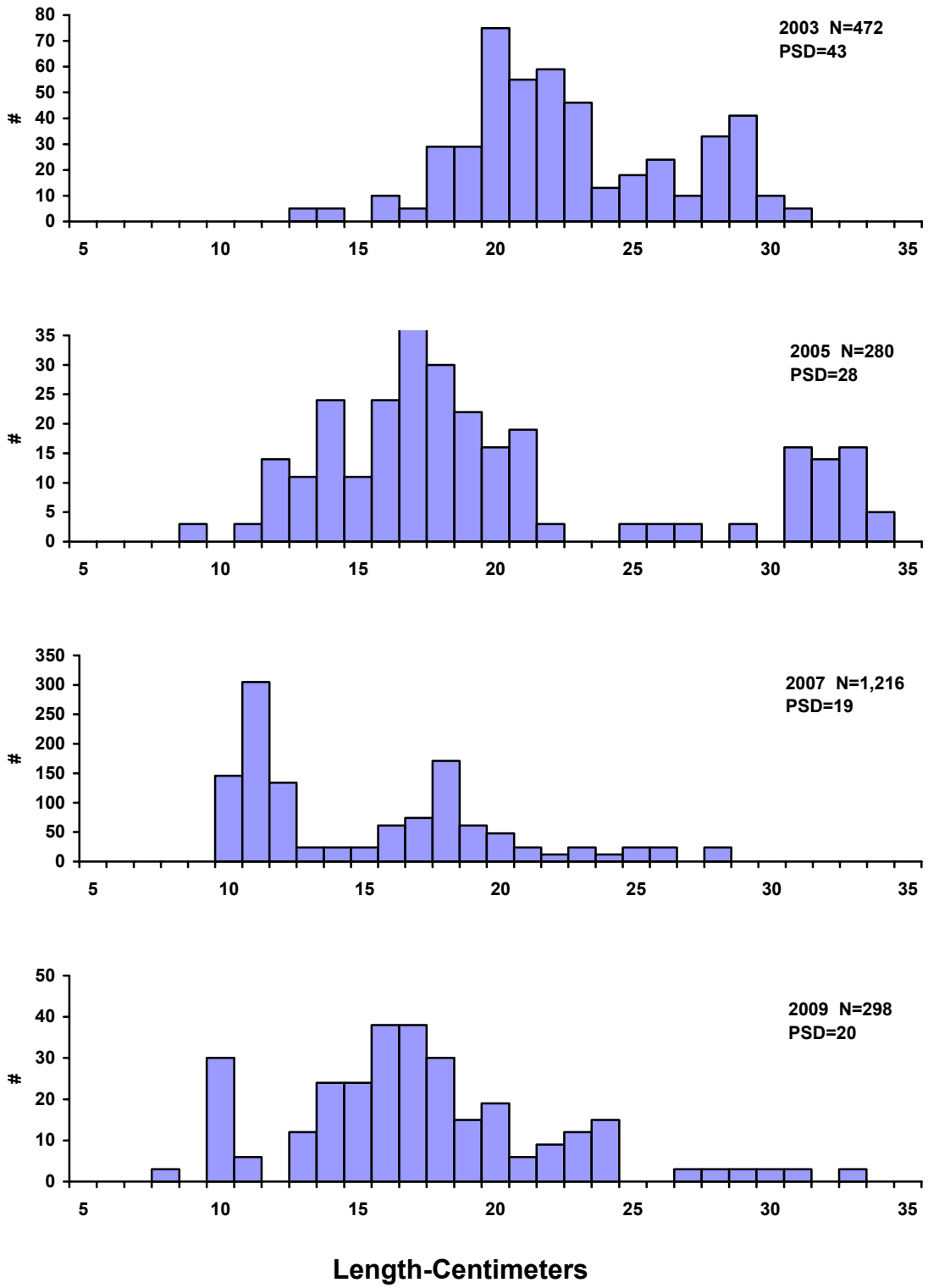

Figure 3. Length frequency histograms for black bullheads sampled with trap nets in Oak Lake, Brookings County, 2003, 2005, 2007 and 2009.

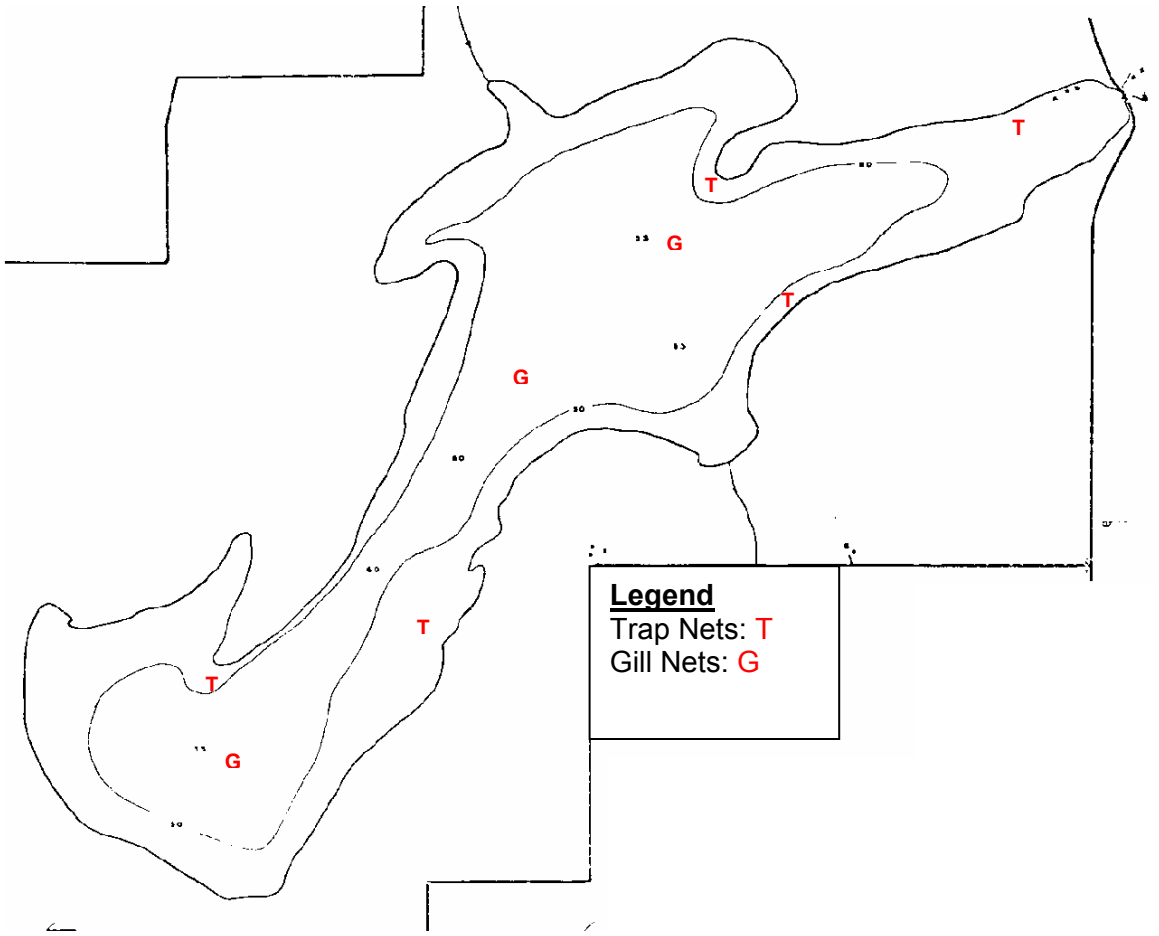

Figure 4. Sampling locations on Oak Lake, Brookings County, 2009.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$PSD = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$RSD\text{-}P = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Saugeye	23	35	46	56	69
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.